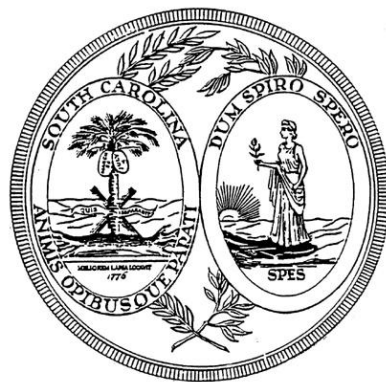


South Carolina Academic Standards and Performance Indicators for Science 2014



Instructional Unit Resource

3rd Grade

South Carolina Academic Standards and Performance Indicators for Science 2014

Third Grade Science Instructional Unit Resource

As support for implementing the *South Carolina Academic Standards and Performance Indicators for Science 2014*, the standards for Third Grade have been grouped into possible units. In the Overview of Units below, the titles for those possible units are listed in columns. Refer to the Overview document to note these unit titles and how Standards, Conceptual Understandings, Performance Indicators, Science and Engineering Practices, and Crosscutting Concepts align. Following the Overview of Units, an Instructional Unit document is provided that delivers guidance and possible resources in teaching our new *South Carolina Academic Standards and Performance Indicators for Science 2014*. The purpose of this document is to provide guidance as to how all the standards in this grade may be grouped into units and how those units might look. Since this document is merely guidance, districts should implement the standards in a manner that addresses the district curriculum and the needs of students. This document is a living document and instructional leaders from around the state will continuously update and expand these resource documents. These documents will be released throughout the 2016-2017 school year with the intentionality of staying ahead of instruction. Teachers should also note that links to the Standards document, A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, the SEP Support Document, and the Support Document 2.0 are embedded throughout the Instructional Unit format for reference.

Acknowledgments

Jean Baptiste Massieu, famous deaf educator, made a statement that is now considered a French proverb. “Gratitude is the memory of the heart. Indeed, appreciation comes when you feel grateful from the depths of your heart. The head keeps an account of all the benefits you received and gave. But the heart records the feelings of appreciation, humility, and generosity that one feels when someone showers you with kindness.” It is with sincere appreciation that we humbly acknowledge the dedication, hard work and generosity of time provided by teachers and instructional leaders across the state that have made and are continuing to make the Instructional Unit Resources possible.

Grade 3 Overview of Units

Unit 1	Unit 2		Unit 3		Unit 4	
PHYSICAL SCIENCE: PROPERTIES AND CHANGES IN MATTER	PHYSICAL SCIENCE: ENERGY TRANSFER--ELECTRICITY AND MAGNETISM		EARTH SCIENCE: EARTH'S MATERIALS AND PROCESSES		LIFE SCIENCE: ENVIRONMENTS AND HABITATS	
Standard	Standard		Standard		Standard	
3.P.2	3.P.3		3.E.4		3.L.5	
Conceptual Understanding	Conceptual Understanding		Conceptual Understanding		Conceptual Understanding	
3.P.2A	3.P.3A	3.P.3B	3.E.4A	3.E.4B	3.L.5A	3.L.5B
Performance Indicators	Performance Indicators		Performance Indicators		Performance Indicators	
3.P.2A.1 3.P.2A.2 3.P.2A.3 3.P.2A.4 3.P.2A.5	3.P.3A.1 3.P.3A.2 3.P.3A.3	3.P.3B.1 3.P.3B.2	3.E.4A.1 3.E.4A.2 3.E.4A.3	3.E.4B.1 3.E.4B.2 3.E.4B.3 3.E.4B.4	3.L.5A.1 3.L.5A.2	3.L.5B.1 3.L.5B.2 3.L.5B.3
*Science and Engineering Practices	*Science and Engineering Practices		*Science and Engineering Practices		*Science and Engineering Practices	
S.1.A.3 S.1.A.4 S.1.A.6 S.1.A.8 S.1.B.1	S.1.A.2 S.1.A.3 S.1.A.4 S.1.A.8		S.1.A.4 S.1.A.2 S.1.A.8	S.1.A.2 S.1.A.3 S.1.A.8 S.1.B.1	S.1.A.4 S.1.A.2	S.1.A.8 S.1.A.2 S.1.A.7
*Crosscutting Concepts	*Crosscutting Concepts		*Crosscutting Concepts		*Crosscutting Concepts	
1, 2, 3, 5, 6, 7	2, 4, 5, 6		1, 2, 3, 4, 6, 7		1, 2, 3, 4, 5, 6	

* Teachers have the discretion to enhance the selected SEP's and CCCs.

Unit Title
Physical Science: Properties and Changes in Matter
Standard
http://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf
3.P.2 The student will demonstrate an understanding of the properties used to classify matter and how heat energy can change matter from one state to another.

Conceptual Understanding				
3.P.2A Matter exists in several different states and is classified based on observable and measurable properties. Matter can be changed from one state to another when heat (thermal energy) is added or removed.				
New Academic Vocabulary				
Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.				
Mass	Graduated cylinder	Graduated syringe	Volume	Temperature
Length	Physical properties	Thermal energy	Solid	Liquid
Gas	Matter	Melting	Freezing	Condensing
Boiling	Evaporation	Burning	Friction	Electricity
Conductor	Insulator			
Performance Indicators				
Text highlighted below in orange and <i>italicized/underlined</i> shows connections to SEP's				
3.P.2A.1 Analyze and interpret data from observations and measurements to describe and compare the physical properties of matter (including length, mass, temperature, and volume of liquids).				

3.P.2A.2 Construct explanations using observations and measurements to describe how matter can be classified as a solid, liquid or gas.

3.P.2A.3 Plan and conduct scientific investigations to determine how changes in heat (increase or decrease) change matter from one state to another (including melting, freezing, condensing, boiling, and evaporating).

3.P.2A.4 Obtain and communicate information to compare how different processes (including burning, friction, and electricity) serve as sources of heat energy.

3.P.2A.5 Define problems related to heat transfer and design devices or solutions that facilitate (conductor) or inhibit (insulator) the transfer of heat.

***Science and Engineering Practices**

Support for the guidance, overviews of learning progressions, and explicit details of each SEP can found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.

3.S.1A.3 Plan and conduct scientific investigations to answer questions, test predictions and develop explanations: (1) formulate scientific questions and predict possible outcomes, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.

3.S.1A.4 Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings.

3.S.1A.6 Construct explanations of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.

3.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.

3.S.1B.1 Construct devices or design solutions to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the devices or solutions, (3) generate and communicate ideas for possible devices or solutions, (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and design if needed, and (6) communicate the results.

***Cross Cutting Concepts** (<http://www.nap.edu/read/13165/chapter/8>)

The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012) The text in **blue** and **italicized/underline** below provides a brief explanation of how the specific content ties to the CCC's.

1. **Patterns:** The National Research Council (2012) states, “observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them” (p. 84). *If heat is added to water, the temperature will increase and it will eventually boil. If heat is removed, the water will cool down, but if enough heat is removed the water will eventually freeze.*
2. **Cause and effect:** The National Research Council (2012) states, “mechanism and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts” (p. 84). *When temperature is increased/decreased, matter changes from one state to another.*
3. **Scale, proportion, and quantity:** The National Research Council (2012) states, “in considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system’s structure or performance” (p. 84). *In each main state of matter (solid, liquid, and gas) physical properties, such as length, mass, temperature, and volume, can be observed and measured.*
5. **Energy and matter:** The National Research Council (2012) states, “flows, cycles, and conservation, tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems’ possibilities and limitations” (p. 84). *Processes such as burning, electricity, and friction serve as a source of heat energy.*
6. **Structure and function:** The National Research Council (2012) states, “the way in which an object or living thing is shaped and its substructure determine many of its properties and functions” (p. 84). *The shape of an object and its substructure determine many of its properties and its response to heat.*
7. **Stability and change:** The National Research Council (2012) states, “for natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study” (p. 84). *When temperature is increased/decreased, matter changes from one state to another.*

**Teachers have the discretion to enhance the selected SEP's and CCC's*

Prior Knowledge
<ul style="list-style-type: none"> ● K.P.4 Observable Properties of Matter; Observation ● 2.P.3 Properties of Matter
Subsequent Knowledge
<ul style="list-style-type: none"> ● 5.P.3 Friction ● 6.P.3 Heat Energy and heat transfer ● 6.P.3 Different Forms of Energy ● 6.P.3 Conservation of energy and heat transfer ● 7.P.2 Describing and Classifying Matter ● 7.P.2 Describing and Classifying; physical properties ● 7.P.2 States of Matter
Possible Instructional Strategies/Lessons
Strategies and lessons that will enable students to master the standard and/or indicator.
<ul style="list-style-type: none"> ● <u>Measurement stations</u> (See Appendices) Students will participate in hands-on stations to explore mass, length, temperature, and volume. The class will then discuss physical properties based on these measurements and observations and summarize the difference between describing and measuring objects. ● <u>Change of State Demonstration</u> (See Appendices) Using a clear beaker, ice cubes, and a hot plate, students will describe how the cube changes from a solid to a liquid. Also, student volunteers will take the temperature as the cube is heated. Upon conclusion (when the water has completely evaporated), students will answer the question, “Where did the water go and why?” ● <u>Sources of Heat Energy</u> (See Appendices) Students will use pictures of common items that show heat being produced. The students will determine how the heat is being produced and communicate their findings to the whole group. ● <u>The Heat is On</u> Students will work in teams to design a container that keeps an ice cube from melting. This resource can be found here: http://www.rhfleet.org/sites/default/files/files/educators-resource-guide/heat_is_on.pdf

Resources

- This website provides a series of activities with printable procedures which covers each of the 5 Performance Indicators. This resource can be found at <http://learning-in-action.williams.edu/opportunities/elementary-outreach/science-lessons/3rd-grade-matter-unit/>

Sample Formative Assessment Tasks/Questions

Additional sample formative assessment tasks/questions for grade bands are located at the end of each of the SEP Support Doc

(http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf)

- Matter Search Students will observe and record examples of solids, liquids and gases in their everyday life. This can be done in the school environment or at home. The teacher may provide a recording sheet or the students can document and classify their observations in a notebook. For example, students can record pencil, notebook, paper for solids; water, milk for liquids; air for gas. The resource is located at <https://www.havefunteaching.com/worksheets/science-worksheets/matter-worksheets/states-matter-worksheet-identify/> and provides a worksheet option for identifying states of matter.
- Where Does it Belong? Working in teams, students will be provided with a bag of materials representative of solids, liquids, and gasses. They will create a triple Venn Diagram to compare and contrast the different objects. After completing the diagram, students will state claims and provide evidence to explain why an object is classified as a particular state of matter or why it might be considered more than one type of matter. For example, a deflated balloon can be both a solid and a gas; a plastic bottle filled halfway can be classified as all three states of matter. The resource is located at <https://www.pdesas.org/module/content/resources/16154/view.ashx> and provides information about each state of matter.

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Pennsylvania Department of Education. (n.d) The Standard Aligned System. Retrieved August 3rd, 2016 from <https://www.pdesas.org/module/content/resources/16154/view.ashx>

Reuben H. Fleet Science Center. *The Heat is On*. [PDF] (n.d.) Retrieved August 5, 2016 from http://www.rhfleet.org/sites/default/files/files/educators-resource-guide/heat_is_on.pdf

States of Matter. [PDF]. (n.d.) Retrieved August 3, 2016 from <https://www.havefunteaching.com/worksheets/science-worksheets/matter-worksheets/states-matter-worksheet-identify/>

States of matter: solid, liquid, and gas. (2016). Retrieved from <https://www.pdesas.org/module/content/resources/16154/view.ashx>

Williams College: Center for Learning in Action. (n.d.) 3rd Grade Matter Unit. Center For Learning in Action. Retrieved August 3rd, 2016 from <http://learning-in-action.williams.edu/>

Third Grade—Properties and Changes in Matter

Measurement Stations

Materials:

- 2X3 Lego brick or Unifix cube
- pencil/pen
- tennis or baseball
- plastic baggies (snack size, quart size, gallon size)
- straw (for filling the plastic baggies with air)
- 3 cups of water
- string (precut a little longer than the circumference of the ball you are using)
- thermometers
- rulers or measuring tapes
- pan balance with gram weights
- graduated cylinders
- beakers or clear tub with volume measurements labeled on the side

Procedures:

Day 1: Set up stations ahead of time on either a tray or box to keep all of the materials together and easier to distribute.

Station 1: Lego or Unifix cube, ruler, pan balance with gram weights and graduated cylinder (about 1/2 filled with water)

Station 2: Pencil/pen, ruler, pan balance with gram weights and graduated cylinder (1/2 filled with water)

Station 3: Tennis or baseball, string, ruler, pan balance with gram weights and beaker (1/2 filled with water)

Station 4: One of each size plastic baggie, straw (this will be used to fill each of the baggies with air), ruler, pan balance with weights, and clear plastic tub (1/2 filled with water)

At each station, the students will measure the length, mass and volume of the object provided, and record the results on the recording sheet provided or one you create.

**With the tennis/baseball the students will need to figure out how to use the string to measure circumference.

**With all objects, you may need to show the students how to measure volume using water displacement and how to measure volume in a graduated cylinder.

Third Grade—Properties and Changes in Matter

Measurement Stations

Once all groups have made their observations and measurements, discuss as a whole group what patterns they noticed in their data and what observations they made about solids, liquids, and gases. Call attention to the fact that they measured gas with the baggies. You may discuss what they noticed about gases just with that one station. Even though they did not measure any liquids yet, they could have made observations based on using liquids to measure volume. In your discussion, guide the students to the understanding that all of these measurements are physical properties of matter.

Day 2:

Instruct students on how to read/use a thermometer and remind them that their hands can adjust the temperature. Before measuring temperature, have the students measure the water's volume and mass and record this data on the Day one data sheet. Ask students "Why can't we measure length of liquid?" Place a cup of water somewhere in the classroom, outside, and in the refrigerator and/or freezer for the same amount of time. Place a Lego brick in the classroom, outside, and in the refrigerator and/or freezer for the same amount of time.

When the allotted time is up, have the students or teacher measure and record the temperatures of each of the materials on the data sheet.

At the conclusion activity have a discussion with the class about this new physical property, temperature, and any observations the students made during the activity.

Third Grade—Properties and Changes in Matter

Measurement Stations

Day One Recording Sheet

Record your measurements in the appropriate boxes.

	Length	Mass	Volume
Lego			
Pencil			
Tennis Ball			
Snack size baggie			
Quart size baggie			
Gallon size baggie			
Water			

Compare the physical properties of these materials based on your measurements and observations.

Day Two Recording Sheet

Record the temperatures for each of the materials.

	Room	Outside	Refrigerator
Lego Block			
Cup of water			

Compare the physical properties of these materials based on your measurements and observations.

Third Grade—Properties and Changes in Matter

Measurement Stations

Standard

3.P.2 The student will demonstrate an understanding of the properties used to classify matter and how heat energy can change matter from one state to another.

Conceptual Understanding

3.P.2A. Matter exists in several different states and is classified based on observable and measurable properties. Matter can be changed from one state to another when heat (thermal energy) is added or removed.

Performance Indicators:

3.P.2A.1 *Analyze and interpret data* from observations and measurements to describe and compare the physical properties of matter (including length, mass, temperature, and volume of liquids).

Science and Engineering Practices

3.S.1A.4 Analyze and interpret data from observations, measurements, or investigations to understand patterns and meanings.

Crosscutting Concepts

3. *Scale, proportion, and quantity*: The National Research Council (2012) states, “in considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system’s structure or performance” (p. 84). *In each main state of matter (solid, liquid, and gas), physical properties, such as length, mass, temperature, and volume, can be observed and measured.*

6. *Structure and function*: The National Research Council (2012) states, “the way in which an object or living thing is shaped and its substructure determine many of its properties and functions” (p. 84). *The shape of an object and its substructure determines many of its properties and its response to heat.*

References

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Third Grade - Properties and Changes in Matter

Change of State

Materials

- 2 clear beakers
- Ice cubes
- Hot plate
- Large Spoon
- Tongs
- Timer
- Ice tray

Procedures

This activity is designed for whole group. Collect materials. Reiterate safety rules and procedures when working with a heat source. Fill ice tray and place in freezer the day preceding the investigation. Place one beaker on the hot plate and one on the table. The beaker on the table will be the control. Using tongs, place the same number of ice cubes in each beaker. Turn the hot plate on and start timer. Have students periodically record observations. Engage students in dialogue about their observations. Where did the water go?

Third Grade - Properties and Changes in Matter

Change of State

Standard

3.P.2 The student will demonstrate an understanding of the properties used to classify matter and how heat energy can change matter from one state to another.

Conceptual Understanding

3.P.2A Matter exists in several different states and is classified based on observable and measurable properties. Matter can be changed from one state to another when heat (thermal energy) is added or removed.

Performance Indicators

3.P.2A.2 [Construct explanations](#) using observations and measurements to describe how matter can be classified as a solid, liquid or gas.

Science and Engineering Practices

3.S.1A.4 [Analyze and interpret](#) data from observations, measurements, or investigations to understand patterns and meanings.

3.S.1A.6 [Construct explanations](#) of phenomena using (1) scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.

3.S.1A.8 [Obtain and evaluate](#) informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.

Crosscutting Concepts

1. **Patterns:** The National Research Council (2012) states, “observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them” (p. 84). [If you add heat to water, the temperature will increase and it will eventually boil. If heat is removed, the water will cool down, and if enough heat is removed the water will eventually freeze.](#)

2. **Cause and effect:** The National Research Council (2012) states, “mechanism and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts” (p. 84). [When temperature is increased/decreased, matter changes from one state to another.](#)

7. **Stability and change:** The National Research Council (2012) states, “for natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study” (p. 84). [When temperature is increased/decreased, matter changes from one state to another.](#)

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Third Grade—Properties and Changes in Matter

Sources of Heat Energy

Materials:

- Various pictures of common items in the environment that produce heat (see below for examples)
- Poster paper and markers
- Demonstration items: candles, lighter or matches, lightbulbs in lamp, hot plate or griddle

Procedures:

Show students pictures of the following items: fire, stove, toaster, oven, the Sun, lightbulbs (lit), candles (burning), engines, and other common items in their environment which produce heat. You could use this as a group activity by having enough pictures for each group to look at.

Ask the students what all of these objects have in common. Facilitate the discussion to arrive at the understanding that the objects produce heat and the surfaces become warm.

Have the students group the same pictures and sort them by how the heat is produced. Examples: fire and candles would be burning; stove and toaster would be electricity; etc. If it is difficult to find pictures showing friction you can have the students rub their hands together to show how heat is produced. You can also demonstrate some of the ways heat is produced. These examples can be burning a candle, heat from a light bulb, etc.

After discussion about how the heat is produced students can use the pictures to create a poster which would communicate what they learned about how heat is produced.

Third Grade—Properties and Changes in Matter

Sources of Heat Energy

Standard

3.P.2 The student will demonstrate an understanding of the properties used to classify matter and how heat energy can change matter from one state to another.

Conceptual Understanding

3.P.2A. Matter exists in several different states and is classified based on observable and measurable properties. Matter can be changed from one state to another when heat (thermal energy) is added or removed.

Performance Indicators

3.P.2A.4 Obtain and communicate information to compare how different processes (including burning, friction, and electricity) serve as sources of heat energy.

Science and Engineering Practices

3.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.

Crosscutting Concepts

5. Energy and matter: The National Research Council (2012) states, “flows, cycles, and conservation, tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems’ possibilities and limitations” (p. 84). Processes such as burning, electricity, and friction serve as a source of heat energy.

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